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Chapter 1

Introductory Chapter: Optimizing the Management Outcomes in Patients with Temporomandibular Disorder

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1. Introduction

Being one of the most controversial topics in dentistry, treatment of temporomandibular disorders (TMDs) requires the clinician to determine the patients' needs and try to help the patient based on the most recent scientific evidence. TMDs are today commonly considered as a collection of various conditions of the temporomandibular joint (TMJ) or the masticatory muscles, which have different etiologies and mechanisms but presenting with similar symptoms [1]. Temporomandibular joint (TMJ) is affected by musculoskeletal disorders of the neck and masticatory system [2], and it is important for the clinical practitioner to tell the difference between the complaint originating from a musculoskeletal disorder and a complaint caused by an intra-articular disorder. By making this discernment, the patient can receive the optimal management and is protected from going under unnecessary surgical interventions.

There are several classification systems for the TMDs. The most recent and the most commonly used classification is the research diagnostic criteria for temporomandibular disorders (RDC-TMD) [3]. The most common intra-articular disorders are known to be reducing and nonreducing anterior disc displacements.

Anterior disc displacement is a condition in which the disc is positioned anteriorly to the mandibular condyle. If the disc reduces on opening, this is called anterior disc displacement with reduction. If the disc does not reduce on opening, then this is called anterior disc displacement without reduction (irreductible disc displacement) which is closely related to acute closed lock [1, 4].

Anteriorly displaced discs are common findings in the asymptomatic patients too. Studies by Larheim et al. [5] and Davant et al. [6] reported that magnetic resonance imaging (MRI) shows that about one third of the asymptomatic patients have displaced discs. It is also known that anteriorly displaced discs are most of the time displaced medially too [7], and it is important to evaluate the patient's complaints and try to resolve the symptoms which are joint sounds, pain, and limited mouth opening. Chronic disc displacement can lead to the adhesion of the disc to the articular fossa. Pain in the TMJ is present in the 10% of the adult population and found more often in women [8]. However, it must be kept in mind that prior to initiating the treatment of a TMD patient, any possibilities of benign and malign tumors, developmental disorders, and fractures should be out-ruled.

If the overloading of the TMJ continues (parafunctional habits, bruxism) remodeling, mechanism is triggered. When overloading exceeds the limits of remodeling, degenerative process of the articular surfaces may begin leading to the osteoarthritis of the TMJ [9].

General consensus in treatment is that the most conservative and the most reversible method should be the initial treatment of choice. This is because temporomandibular disorders have a tendency of improving over time, and clinical experience shows that sometimes conservative treatments are as effective as invasive methods in relieving the patient's symptoms [10].

When a patient is referred to a dentist for a complaint of temporomandibular disorder, oral history must be taken, and the patient should initially be examined for medical pathologies of the head and neck, including intraoral examination to search for a pain of dentoalveolar origin, type of occlusion, and any indicator of parafunctional habits such as bruxism. Imaging studies should be performed if necessary. The patients should also be evaluated for neurological and psychological conditions and should be referred to a specialist if necessary [11].

Management of the TMD patient may require a multidisciplinary approach. Physical therapy, cognitive behavioral intervention, educating the patients on self-care, and sometimes referring the patient to a psychologist or psychiatrist are all parts of the management. However, in most of the cases, a dental practitioner can begin the initial management. Using a step-by-step approach, a wide range of treatment modalities may be applied alone or in combination with each other. When conservative methods are ineffective in treating the patient, more invasive methods are applied, and open surgery may be indicated in patients not responding to other treatments. The practitioner should know that duration of symptoms is an important factor in the treatment success even in open surgery; earlier interventions have a higher chance for success [12].

Being an important aspect of the management of the patients with TMD, patient education requires full compliance of the patient because the treatment may fail due to the non-cooperative behavior of the patient.

The patient should be informed not to contact the teeth during rest (preventing clenching at daytime), being aware of parafunctional habits such as nail biting, lip-cheek chewing, and jaw protrusion [1].

The patient must be informed that he/she should have a soft diet and should limit the range of mouth opening. Slow chewing, decreasing the amount of daily tea, and coffee consumption

are all parts of the treatment [1, 13]. Biting the food using incisors should be avoided, and biting on the effected side is recommended in case of joint pain [1].

Self-management is another important part of the management process. Self-massage is the initial self-management therapy, which is found to be very helpful in pain management especially in patients with masticatory muscle-originated pain [14, 15]. In myofascial pain massaging, the trigger points especially lead to improvement in pain even though it is temporary, and the massage must be continued to keep the benefits obtained from it [13].

Another self-management method is the application of moist heat or application of ice especially in cases of local myalgia and myofascial pain [1]. As a simple method, 20 minutes of hot bath is found to be effective in decreasing muscle pain.

Another method that can be used is the application of a hot pack to the tender site for 20 minutes three times a day. Heat relaxes the muscles and provides increased blood flow to the muscles. Also when cold is applied, as a reaction in order to increase the heat in the cold-applied muscle, the brain increases the blood flow to the muscle by vasodilatation providing an improvement in pain. Most of the studies on cold application are about acute pain, so there is little data on the application of cold for the management of chronic pain [16].

Pharmacological therapy is a part of TMD management. Nonsteroidal anti-inflammatory drugs (NSAIDs), analgesics, muscle relaxants, anxiolytic drugs, local anesthetics, antidepressants, and corticosteroids are indicated in TMD treatment.

2. Nonsteroidal anti-inflammatory drugs

Analgesics and NSAIDs form an important part of the pharmacological treatment of the osteoarthritic TMJ. The American College of Rheumatology guidelines recommend the use of paracetamol as the first medication of choice for the osteoarthritic hip and knee [17–19]. The use of paracetamol is also recommended for the management of osteoarthritis by some authors; however, they conclude that paracetamol is effective in osteoarthritis only at very high, near toxicity level doses. Ibuprofen and naproxen are recommended agents in osteoarthritis of the TMJ, but in the management of chronic pain, cox-2 inhibitors such as celecoxib or meloxicam should be preferred, not only for their effectiveness in chronic pain but also for less gastrointestinal effects, for they may require a prolonged use in chronic pain [20].

NSAIDs provide anti-inflammatory effects and analgesia for the TMD patients with osteoarthritis, capsulitis, synovitis, myositis, and pain related to reducing and nonreducing disc displacements [21].

Naproxen, ibuprofen, and diclofenac are the most often used NSAIDs [22]. Mejersjo and Wenneberg [23] have studied the effects of diclofenac 50 mg, given orally 3 ×1 in patients with TMJ arthritis. Their findings at the end of 3 months produced results similar to efficacy of occlusal appliances.

Anti-inflammatory properties of corticosteroids are greater than that of NSAIDs. Because the long term systemic use of corticosteroids may lead to complications such as Cushing's syndrome, diabetes, and osteoporosis, they must be used only for a short time [24]. Anxiolytics is also recommended for a limited period of use because of their potential for dependency. Their sedative and muscle relaxant properties help reduce the effects of masticatory parafunctional habits such as bruxism. They help patients cope with stress, which is an important etiologic factor of TMD, stress-induced muscular hyperactivity, and dysfunction [22, 25]. A recent animal study has shown that the benzodiazepines also have effects on the biochemical content of the TMJ [26].

Usually used in combination with NSAIDs, centrally acting muscle relaxants help relax the masticatory muscles, and the patients may also benefit from their sedative properties [22]. The aim of using the muscle relaxants in the TMD patient is not only to manage acute muscle pain but also to decrease muscle activity for a limited period [27, 28].

The mechanism via which the muscle relaxants help the TMD patients is not totally clear. The prescribed doses are not high enough when taken orally to relax masticatory muscles locally. So, it is believed that their sedative and stress-reducing effects are more effective in helping the TMD patient [27].

Chlorzoxazone, cyclobenzaprine, methocarbamol, and diazepam are the most commonly used centrally acting muscle relaxants. All of these drugs have sedating effects, so the patients should preferably take them at bedtime [29].

Tizanidine is a spasmolytic agent, and there is so far only one clinical trial studying its effectiveness in the TMDs. Alencar et al. [30] have reported that tizanidine and cyclobenzaprine have effects similar to placebo on myofascial pain patients.

Even though there is little scientific evidence to support the efficacy of opioid analgesics in TMDs, they are usually prescribed together with non-opioid analgesics, in the management of TMJ pain. However, they must be used with caution for their tendency to create dependence in the patients. Opioid analgesics should be used only for short periods such as 2–3 weeks [22].

Hydrocodone is an opioid analgesic used in combination with a non-opioid analgesic or a NSAID in order to manage moderate to severe pain [31]. However, hydrocodone is not very effective in chronic pain cases. Codeine, morphine, oxycodone, hydromorphone, and fentanyl are also among the opioid analgesics preferred in the management of pain. The use of opioid analgesics is considered safe in some forms of noncancer pain as long as patients are selected carefully, well monitored for adverse effects, and onset of dependence [32].

However, it is still a subject of debate, which kind of opioids to use in the management of TMJ pain. Opioids are classified as short-acting and long-acting opioids. Short-acting opioids have the advantage of rapid onset of pain relief; however, they have a higher risk of drug-related adverse effects [33]. Long-acting opioids also help improve pain, and there is less reported drug-related adverse effects in patients [34]. However, Argoff and Silvershein [35] have not found any differences between the two types of drugs for efficacy.

Currently, due to lack of enough randomized controlled clinical trials on the clinical efficiency of pharmacological agents on TMD-related pain, it must be kept in mind that the pharmacological treatment in TMD patients is mostly empirical [36, 37].

Occlusal splints are the most commonly used treatment modality in the management of TMDs. Occlusal splints help in relieving the muscle hyperactivity originating from bruxism. Occlusal appliances also provide relief from occlusal overload to the TMJ and inhibit strain [38].

Casares et al. have [39] measured the effects of occlusal splints on intra-articular pressure using a pressure transducer, and they have concluded that stabilization splints significantly reduced the intra-articular pressure in the upper joint compartment. They have also reported better joint function as an outcome of splint treatment.

Conti et al. [40] have reported that even though behavioral treatment improves symptoms in patients with myofascial pain in short term, occlusal splints may accelerate the process, helping the patients to get positive results earlier. Another study even has hinted that occlusal splints may be helping improve the psychological status of the TMD patients [41].

First described for the temporomandibular joint by Nitzan et al. [42], arthrocentesis is simply the irrigation of the superior TMJ compartment using two needles and is considered to be an efficient process with low morbidity rate [43]. When applied for the treatment of TMJ osteoarthritis, this process removes degradation products and inflammatory mediators from the joint [44, 45]. However, Laskin [44] has stated that intra-articular lavage may also remove the favorable agents such as hyaluronic acid from the intra-articular space too. TMJ arthrocentesis may inhibit pain and increase the range of mandibular motion [42, 46, 47].

Two needles are used for irrigation and outflow of the irrigation solution, which is in most cases ringers lactate solution [9]. The amount of ringer's solution is a subject of debate and varies between 60 ml [48] and 200 ml [49] in the literature.

The current understanding in the management of TMDs positions arthrocentesis after the initial conservative treatment modalities. When the conservative treatment fails, then arthrocentesis is indicated. However, some studies have evaluated the outcomes of arthrocentesis as an initial treatment. Vos et al. [50] have studied 80 patients in which 40 patients had arthrocentesis as an initial treatment, and the other 40 received conservative treatment as control. They have reported a more rapid improvement in symptoms following arthrocentesis, whereas the conservative treatment group showed a more gradual improvement. Their study has also shown that both methods produced similar results at the end of 26 weeks. However, they have discussed that this might be partially due to conservative treatment being dependent on patient compliance, whereas arthrocentesis is not, which may affect the outcome of the study. Machon et al. [45] have reported arthrocentesis to be more effective when combined with splint therapy.

Arthrocentesis may be performed in combination with the injection of various agents such as sodium hyaluronate [51] and corticosteroids (It has been previously reported that corticosteroids have positive effects on pain and function when injected intra-articularly) [52, 53]. For this reason, corticosteroid injection alone or in combination with arthrocentesis is used for treatment of the internal derangements of the TMJ. However, the injection of corticosteroids into the TMJ is still controversial due to reported complications such as bone necrosis, destruction of the cartilage, and progression of the degenerative disease [54–56]. These complications are reported to be mostly due to multiple injections or high-dose injections, and single injections are considered to be safe [57].

Sodium chlorate injections are also commonly used in the TMDs [58–61]. They are either used in single injections or multiple injections, and multiple arthrocenteses followed by multiple injections of sodium hyaluronate have been found to be beneficial in patients with internal derangement [62, 63].

However, Manfredini et al. [51] have stated that a single dose of sodium hyaluronate injection following single arthrocentesis produced benefits similar to multiple interventions.

Emes et al. [64] have compared the effects of arthrocentesis to tenoxicam injection alone and reported no differences between the groups. However, their groups consisted of patients who did not respond to a previous arthrocentesis.

Sipahi et al. [48] have injected morphine and tramadol following arthrocentesis into the TMJs of patients with TMJ pain and have concluded that injection of morphine has significantly increased pain relief for 6 months. They have had similar pain relief with tramadol too, but this relief period was shorter in tramadol when compared to morphine.

Arthroscopy of the TMJ is an invasive surgical technique, which is used for the diagnosis and treatment of internal derangements of the TMJ [9]. It also has a low risk of degenerative articular change in the long term, which makes it a safe procedure (has lower complications than open surgery and less invasive than open surgery) [65]. However, it is not beneficial in examining the lower joint compartment. When there is a degenerative process affecting the lower joint compartment, usually an open surgery is indicated. Arthroscopy and arthrocentesis have similar benefits in TMDs, but arthroscopy is the technique of choice in the diagnosis and management of rheumatoid disorders affecting the TMJ [66]. It can also be used for techniques other than simple lysis and lavage; for example, Murakami et al. [67] have reported that arthroscopic lateral release of the capsule and anterior discal release were more effective than arthrocentesis in increasing the range of mouth opening.

Several studies show that the majority of TMDs can be managed by nonsurgical methods. When these methods fail to help the patient with his/her symptoms, then invasive techniques, such as arthrocentesis and arthroscopy, or open joint surgery are indicated [68]. Open procedures are used in order to reposition the anteriorly displaced disc, remove the anteriorly displaced disc, or remove and replace it (by temporalis flap, auricular cartilage, or an alloplastic material) [69, 70]. Several studies conclude that, in the treatment of the internal derangement of TMJ, open surgery is more effective in decreasing pain when compared to arthroscopic surgery [69, 70–73].

3. Conclusion

The treatment of the TMD patient is challenging for the clinician because of the complex pathophysiology of the disorder, and deciding the optimal method for these patients is a difficult task. Our current treatment modalities all have some degree of placebo properties, and due to lack of randomized controlled clinical trials with placebo, our treatment protocols may fall within the boundaries of empirical treatment. In most cases, optimal treatment is the treatment targeting the patient's individual needs, a step-by-step approach, avoiding aggressive, radical surgical protocols as much as possible, will be beneficial for the patient and increase the successful outcomes of our treatment.

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